

REMARKS/ARGUMENTS

Claims 1-68 are currently pending in the above application. For at least the reasons set forth below, Applicants submit that the claims are patentably distinguishable over the cited art.

Claims 1-68 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,159,646 to Jeon et al. (Jeon), in view of U.S. Patent No. 5,964,951 to Yamamoto, and U.S. Patent No. 6,200, 724 to Namiki.

Claim 1 is directed to a rework process for removing an imaging layer from a substrate stack. The stack includes a substrate, an organic underlayer adjacent to the substrate, and an imaging layer that has silicon adjacent to the organic underlayer. The process involves the steps of: (a) contacting the substrate stack with an imaging layer removal solvent; followed by (b) removing the imaging layer with the imaging layer removal solvent thereby forming an organic substrate/underlayer stack. The imaging layer removal solvent for this process is selected from glycol ethers, ketones, esters, lactates, dimethylsulfoxide (DMSO), dimethylformamide (DMF), tetrahydrofuran (THF), methyl tetrahydrofuran, dioxane, tetrahydropyran, ethyl tetrahydropyran-4-acetate, methyl tetrahydropyran-4-methanol, tetrahydropyran-4-one, n-butyl acetate, n-amyl acetate, and any combinations of those solvents; and finally (c) removing the imaging layer removal solvent from the organic substrate/underlayer stack after the imaging layer is removed.

Claim 22 is directed to a lithographic imaging rework process for correcting one or more defects on an imaging layer on a substrate stack. The stack includes a substrate, an organic underlayer adjacent to the substrate, and an imaging layer that has silicon adjacent to the organic underlayer. The process involves the steps of: (a) contacting the substrate stack with an imaging layer

removal solvent is selected from glycol ethers, ketones, esters, lactates, dimethylsulfoxide (DMSO), dimethylformamide (DMF), tetrahydrofuran (THF), methyl tetrahydrofuran, dioxane, tetrahydropyran, ethyl tetrahydropyran-4-acetate, methyl tetrahydropyran-4-methanol, tetrahydropyran-4-one, n-butyl acetate, n-amyl acetate, and any combinations of these solvents; (b) removing the imaging layer with the imaging layer removal solvent, thereby forming an organic substrate/underlayer stack; (c) removing the imaging layer removal solvent from the organic substrate/underlayer stack after the imaging layer is removed; (e) coating the substrate/underlayer stack with a new imaging layer; (e) exposing the new imaging layer to radiation; and (f) developing the new imaging layer.

Claim 57 is directed to a rework process for removing an imaging layer from a substrate stack. The stack includes a substrate, an underlayer adjacent to the substrate, and an imaging layer that has silicon adjacent to the underlayer. The process involves the steps of: (a) contacting the substrate stack with an imaging layer removal solvent; (b) removing the imaging layer with the imaging layer removal solvent thereby forming an organic substrate/underlayer stack, wherein the imaging layer removal solvent is selected from glycol ethers, ketones, esters, lactates, dimethylsulfoxide (DMSO), dimethylformamide (DMF), tetrahydrofuran (THF), methyl tetrahydrofuran, dioxane, tetrahydropyran, ethyl tetrahydropyran-4-acetate, methyl tetrahydropyran-4-methanol, tetrahydropyran-4-one, n-butyl acetate, n-amyl acetate, and any combination of those solvents; (c) rinsing the imaging layer removal solvent from the organic substrate/underlayer stack with a rinse solution after the imaging layer is removed; and finally, (d) baking the substrate/underlayer stack to remove the rinse solution.

Jeon generally describes a thinner composition, a method, and a rework process for removing the entire photoresist layer from a semiconductor substrate where an etching failure occurs during photoetching. (Col. 3, lines 49-56).

Yamamoto generally describes a rinsing solution for a lithographic process, which comprises a homogeneous solution of a water-soluble organic solvent and water. The solution is used as a solvent for resists or antireflective layers. (Col. 2. Line 9-16).

Namiki generally describes a chemical amplification resist composition for forming resist patterns which comprises an alkali-soluble Si-containing base resin, a photoacid generator, and a dissolution inhibitor. (Col. 6, line 51-57).

Applicants respectfully submit that the Action fails to set forth a prima facie case of obviousness because Jeon, Yamamoto, and Namiki alone or in combination, fail to teach or suggest all the claim limitations of Applicant's invention.

To establish a prima facie case of obviousness, the Action must include three criteria. First there must be a suggestion or motivation in either of the references, or in the knowledge generally available in the art, to modify the reference or teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference, (or references when combined) must teach or suggest all the claim limitations. Moreover, the teaching or suggestion to make the claims combination and reasonable expectation of success must be found in the prior art and not based on the applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir.1991). MPEP 706.02(j).

As conceded by the Action, Jeon does not disclose or suggest Si-bearing resists. Additionally, Jeon fails to disclose or suggest the removal of a photoresist from an organic underlayer, as recited by the process steps of claims 1, 22, and 57. To the contrary, Jeon discloses a rework process to remove photoresist from a semiconductor substrate which is metallic, or an insulating layer such as an oxide or nitride. Moreover, Jeon fails to disclose or suggest the process step of formation of an organic substrate/underlayer stack after removal

of the imaging layer as recited by step (b) in claims 1, 22, and 57. This process step is not possible in Jeon, because no underlayer is present, let alone an organic substrate/underlayer as in the claimed invention. Therefore, it is not surprising that Jeon also fails to disclose or suggest the subsequent step (c) recited in claims 1 and 22, which require removal of the imaging layer removal solvent from the organic substrate/underlayer stack, since this stack is clearly not present or contemplated by Jeon. Furthermore, Jeon also fails to disclose or suggest a rinse solution, a bake step to remove the rinse solution, or the removal of the imaging layer solvent before recoating, as recited by steps (c) and (d) of claim 57.

Yamamoto fails to cure the above deficiencies of Jeon. Yamamoto describes a stripping solution for removing resists and antireflective coatings from wafers. In contrast to Applicant's claims 1, 22, and 57, Yamamoto removes both the photoresist and the antireflective coating. Applicant's invention provides processes of reworking an imaging layer over an organic underlayer without having to reprepare the organic underlayer, which is not removed. Therefore, by teaching the removal of both layers, Yamamoto teaches away from Applicant's recited claims, which require the retention of the organic underlayer. Additionally, Yamamoto fails to disclose or suggest step (c) recited in claims 1 and 22, which requires removal of the imaging layer removal solvent from the organic substrate/underlayer stack, since this stack is clearly not present. Furthermore, Yamamoto also fails to disclose or suggest a rinse solution, a bake step to remove the rinse solution, or the removal of the imaging layer solvent before recoating, as recited by steps (c) and (d) of claim 57.

Namiki fails to cure the above deficiencies. While Namiki teaches a chemically amplified photoresist containing silicon, Namiki fails to disclose or suggest any photoresist rework process, let alone one according to the presently claimed invention. Moreover, the Action's assertion that Namiki's Si-bearing resist is easily soluble in conventional organic solvents fails to satisfy the

requirements for a prima facie case of obviousness. As noted above, this suggestion to combine Namiki's Si-bearing resist with Jeon's rework process must come from the references, not from hindsight reasoning based on Applicant's disclosure. Even if one were to incorrectly assume motivation to use Namiki's Si-bearing resist in Jeon's rework process, one still fails to arrive at the claimed invention, since Namiki fails to remedy the deficiencies of Jeon with respect to providing a process of reworking an imaging layer over an organic underlayer without having to remove and reprepare the organic underlayer as recited in the claimed invention for the preparation of the underlayer surface for suitable lithography in subsequent processing.

In response to the Action's, contention (page 4 of Action) that the rework process would not continue if the layer underneath were damaged, Applicants submit that the Action fails to consider the differences between Yamamoto and Jeon's processes, in comparison to those of Applicant's claims. In both Yamamoto and Jeon, all of the layers are dissolved to expose the original substrate. However, Applicant's disclosure involves an organic underlayer which remains on the substrate after the rework strip, which is followed by a subsequent distinct step to remove the rework solvent. Moreover, as noted above, step (c) of claims 1 and 22, and steps (c) and (d) of claim 57 are not disclosed or suggested in the cited art, taken alone or in combination.

Therefore, since neither Jeon, Yamamoto, and Namiki, taken alone or in combination, disclose or suggest Applicant's claimed invention, Applicants respectfully submit that the Action has failed to set forth a prima facie case of obviousness. Accordingly, reconsideration of the 103(a) rejection of claims 1-68 is respectfully requested.

Applicant's respectfully submit that the present invention, as recited by Independent claims 1, 22, and 57, and dependent claims 2-21, 23-56, and 58-68, would not be obvious to a skilled artisan relying on Jeon, Yamamoto, and Namiki

since each reference fails to disclose or suggest all the limitations of Applicant's claims.

Accordingly, indication of the allowability of all pending claims is respectfully requested.

Respectfully submitted,

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